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ABSTRACT

This bulletin of the Schools Council (London, England) provides a general description of the state of mathematics curriculum development in Great Britain, annotated listings of eleven curriculum research and development projects, and a list of fourteen selected Schools Council publications. Information on how to obtain publications or further information is also provided. (SD)

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Schools Council

curriculum research and development in mathematics

March 1975

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Mathematics can lay claim to a greater variety of initiatives in curriculum development since the war than any other single subject. Even before the Nuffield Foundation took the momentous step of setting up its Primary Mathematics Project in the early 1960s, significant changes had begun to take place in primary-school mathematics as a result of the determined efforts of one of Her Majesty's Inspectors, SI Miss E. E. Biggs. The Council was subsequently indebted to her as the author of its Curriculum Bulletin 1, *Mathematics in Primary Schools*. The distinction is sometimes drawn that Miss Biggs' work has been mainly concerned with method and that of the Nuffield project with mathematical content, but in fact the overlap is so considerable that it would be more accurate to describe the difference as one of emphasis. In each case there is much investigation of the possibility of doing Stage A work — the mathematics teacher's term for the informal, exploratory stage of coming to grips with a new concept — on a much wider range of topics than hitherto. The age range covered by the Nuffield project, 5–13, may now be seen as a fortunate choice in view of the emergence of middle schools as an organizational form, but a choice for which credit may nevertheless be claimed since its purpose was from the start to ensure continuity between the traditional primary and secondary stages. The Council has now undertaken a study of the present state of mathematics in primary schools, with a view to identifying and describing the major approaches in use.

At the secondary level the picture was even more varied. In addition to the outstandingly successful School Mathematics Project, new syllabuses suitable to examination candidates have been developed by the Midland Mathematics Experiment, by St Dunstan's College, Catford and by Mathematics in Education and Industry, while other interesting initiatives are associated with Shropshire, Leicestershire, Nottingham and Swansea. The list is by no means complete, and in particular does not refer to the many developments, mostly of a local or individual character, aimed at incorporating a study of computing as part of the mathematics syllabus or of general education.

Coming in to a situation where much of this activity was already going on, the Schools Council had to consider at what point its own contribution could be most effective. One of its own major concerns at the outset was the establishment of a curriculum development programme designed to assist teachers to meet demands created by the raising of the school leaving age, and since it appeared that less attention was being devoted to meeting the mathematical needs of less able pupils than to the needs of others, the Mathematics for the Majority Project was set up for this purpose. During the course of this project, which has now come to an end on the completion of its original remit, the value of further work of a rather different kind designed to help the same range of pupils has become apparent, and this is being undertaken by the Mathematics for the Majority Continuation Project.

It has been decided that there is scope for development work of particular kinds at sixth-form level; the Sixth Form Mathematics Project incorporates an original approach to syllabus analysis and the production of learning material in large quantities, while the Continuing Mathematics Project sponsored by the National Council for Educational Technology with support from the Schools Council, aims at exploiting a range of media in packaged mathematical material suited to non-specialists in the sixth form.

The variety of the available material at the secondary level has created problems for teachers, who have found it difficult to assess the value and suitability of different approaches in relation to their own teaching circumstances. The Council has therefore funded a project to carry out a critical appraisal of the importance, inter-relations, and applications of the major topics that feature in current mathematics syllabuses, whether traditional or modern in outlook. It is hoped that such an operation, while avoiding becoming a best-buy exercise, will provide teachers with criteria that will help them to select material best suited to the needs of their pupils.

More recently, the Council has approved the Early Mathematical Experiences project which will aim to give guidance to teachers about ways in which the development of mathematical concepts can be stimulated in children between the ages of 3 and 5.

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RESEARCH AND DEVELOPMENT PROJECTS

Further details of all projects are given in *Schools Council Project Profiles and Index*, available at £1 including postage (£1.20 overseas) from Information Section, Schools Council. Information on individual projects is available from the Council's Project Information Centre.

Early Mathematical Experiences

This project hopes, by observing nursery classes and relating their work to the theoretical development of early mathematical concepts, to identify and classify relevant experiences leading to mathematical ideas and to produce guides for teachers to help them in stimulating the development of mathematical concepts in young children. The project is working with groups of teachers throughout the country.

3–5 years 1974–77

Professor and Mrs G. Matthews, Centre for Science Education, Chelsea College, Bridges Place, London SW6 4HR.

Nuffield Mathematics

The project aimed to devise a contemporary approach to mathematics for children from 5–13 through the development of teachers' guides that stress 'how to learn' rather than 'what to teach'. The guides fall into three main categories — teachers' guides on computation and structure, shape and size, and pictorial representation and graphs leading to algebra; weaving guides, related to all the teachers' guides; and check-up guides. Although there are no primary-school pupils' materials, twenty modules are being published for lower secondary school children. All books are published by Murray and Chambers.

5–13 years 1964–71

Professor Geoffrey Matthews, Nuffield Foundation, Nuffield Lodge, Regents Park, London NW1 4RS

Nuffield Mathematics: Development of Individual Assessments

The development of a series of 'check-ups' on concept attainment in mathematics, so that teachers using the Nuffield Mathematics guides can confirm progress made by individual children.

Checking-up 1, 2 and *3* are published by Murray and Chambers.

5–13 years 1966–70

Dr L. Pauli, Institut des Sciences de l'Education, Palais Wilson, Geneva, Switzerland.

Primary School Mathematics — Evaluation Studies

An initial feasibility study was established to try to get a general picture of the ways in which primary school mathematics is taught at present and to look for ways of describing distinctive approaches to it. The current project is investigating children's competence in mathematics, using questions covering a wide area of topics and looking at teachers' attitudes and methods. A research report will be prepared.

5–11 years 1972–75

Professor J. Wrigley, School of Education, University of Reading, Reading, Berkshire RG1 5AQ

Science and Mathematics in Welsh Medium Schools

This project aimed to encourage an investigatory approach in the learning of science and mathematics through the medium of Welsh.

Two teachers' guides and sixty pupils' booklets were published by English Universities Press in 1974.

5–12 years 1969–72

M. Griffiths, Faculty of Education, University College of Wales, Aberystwyth, Cardiganshire.

Midlands Mathematics Experiment

The Schools Council has assisted the Midlands Mathematics Experiment with its programme of development work on GCE A-level and O-level and CSE course materials.

CSE and O-level texts published by George Harrap. A series of A-level topic books is available from R. H. Collins, 31 Oldway Drive, Solihull, Warwickshire.

11–18 years 1961–72 (SC support 1968–71)

R. M. Stokes, Coventry College of Education, Kirby Corner Road, Canley, Coventry CV4 8EE

The Mathematics Curriculum: A Critical Review

This project will produce a series of surveys of central mathematical topics, intended to give a synoptic view of the topic at school level. The survey will include a discussion on ways of introducing the topic, will analyse the advantages and disadvantages of each approach and look at possible applications.

11–16 years 1973–76

Professor J. V. Armitage, Shell Centre for Mathematical Education, University of Nottingham, Nottingham NG7 2RD

Mathematics for the Majority

This project aimed at providing teachers with guidance and source materials to help them construct courses in mathematics for pupils of average and below average ability. The aim has been to use mathematical situations to encourage powers of judgement and imagination, to give a background to numeracy in everyday life, to remove barriers separating mathematics from other subjects and interests and to help children appreciate some of the order and pattern of their environment. A report of the feasibility study from which the project developed was published as *Mathematics for the Majority* (Working Paper 14).

Fifteen teachers' guides published by Rupert Hart-Davis Educational.

13–16 years 1967–72

Philip Floyd, Institute of Education, University of Exeter, Gandy Street, Exeter EX4 3QL (Mr Floyd has now retired).

Mathematics for the Majority Continuation Project

This project arose from the work of the Mathematics for the Majority Project to provide classroom materials for mathematical learning for non-academic children aged 13–16. The materials have been produced by groups of teachers in all parts of the country, and the underlying theme of each pack is mathematics and the environment. The first two of twelve packs, *Buildings* and *Communications*, have been published by Schofield and Sims in 1974. A further ten packs will be published by Schofield and Sims.

A 16 mm. film, entitled *Teacher Based Curriculum Development*, showing the work of the project is available for sale or hire from the project. The project has an additional grant to adapt its materials for use with visually handicapped pupils.

13–16 years 1971–75

N. Pass, 3 The Cloisters, Cathedral Close, Exeter, EX1 1HS

Sixth Form Mathematics Project

The project is concerned to review the content of sixth-form mathematics, and to develop and evaluate new materials appropriate to mathematical specialists, scientists and the general education of sixth formers. Teacher and pupil materials are being tested, closely related to actual situations and uses, and a report on sixth-form mathematics syllabuses is in preparation. Materials to be published by Heinemann Educational from 1975.

16–18 years 1969–76

C. P. Ormell, School of Education, University of Reading, Reading, Berkshire RG1 5AQ

Continuing Mathematics

This project, established by the Council for Educational Technology, is preparing modules of largely self-instructional materials for sixth formers who need mathematics as an ancillary subject, but who would not normally prepare for examination in this subject at A-level.

16–18 years 1971–75

Robert Morris, Mantell Building, University of Sussex, Falmer, Brighton BN1 9RF

A further number of Council projects that are primarily concerned with other subjects also contain elements of mathematics. Readers are referred especially to the additional free leaflets in this series:
Schools Council: curriculum research and development in science
Schools Council: curriculum research and development in environmental education

SELECTED SCHOOLS COUNCIL BIBLIOGRAPHY

Working Papers

9 *Standards in CSE and GCE: English and mathematics* (by Professor J. Wrigley, F. H. Sparrow and F. C. Inglis) HMSO 1967 22½p (27p)

14 *Mathematics for the majority: a programme in mathematics for the young school leaver* HMSO 1967 25p (29½p)

Examinations Bulletins

2 *The Certificate of Secondary Education: experimental examinations – mathematics* HMSO 1964 17½p (20p)

7 *The Certificate of Secondary Education: experimental examinations – mathematics 2* HMSO 1965 22½p (27p)

20 *CSE: a group study approach to research and development* (edited by Dr W. G. A. Rudd) Evans/Methuen Educational 1970 £2

25 *CSE: Mode 1 examinations in mathematics: a study of current practice* SBN 423 49560 7 Evans/Methuen Educational 1972 50p

30 *Comparability of grade standards in mathematics at GCE A level* (by J. F. Scott) ISBN 0 423 89460 9 Evans/Methuen Educational 1975 60p

Curriculum Bulletins

1 *Mathematics in primary schools* HMSO 1965 4th edition 1972 75p (83½p)

Committee for Wales Publications

Metrigeiddio ac addysg 1972 Schools Council Committee for Wales, Cardiff 25p

Non-series Publications

Change for a pound: a teaching guide for the introduction of decimal currency and the adoption of metric measures SBN 11 880013 2* HMSO 1968 2nd edition 1970 20p (22½p)

Measure for measure: a guide to metrication for workshop craft and technical studies SBN 423 47720 3 Evans/Methuen Educational 1970 30p

Metres, litres and grams: introducing metrication in the primary school SBN 423 46520 1 Evans/Methuen Educational 1971 40p

Recent Articles in *Dialogue*

13 'Environmental mathematics in a village school' by J. L. Wood

14 'Creating materials for mathematics: a report from a teachers' writing group' by Bob Shaw and Elaine Newman (Mathematics for the Majority Continuation Project)

Notes on obtaining publications

For titles published by HMSO (–1969) and new editions of these, order through any bookseller or direct by post from HMSO, PO Box 569, London SE1 9NH (prices in brackets include postage). In the US information on Schools Council titles published by HMSO is available from Pendragon House Inc., 220 University Avenue, Palo Alto, California, 94301 and in Canada from Pendragon House Ltd, 69 Bathurst Street, Toronto M5V 2P7

For titles published by Evans/Methuen Educational (1969–) orders, including standing orders, should be placed with bookshops or suppliers. In case of difficulty contact Sales Department, Evans/Methuen Educational, North Way, Andover, Hants. Evans/Methuen Educational titles are distributed in the US by Citation Press, Scholastic Magazines Inc., 50 West 44th Street, New York, NY 10036 and in Canada by Scholastic-TAB Publications Ltd, 123 Newkirk Road, Richmond Hill, Ontario

DIALOGUE

Sent free to schools (via LEAs), teachers' centres, colleges of education and further education, and institutes and departments of education. Subscriptions 24p for three issues (55p outside UK) to Information Section, Schools Council, 160 Great Portland Street, London W1N 6LL.